Configuring InfoSphere Data Replication CDC on Microsoft cluster services with failover capability

A step-by-step guide for configuring IIDR CDC on MSCS

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InfoSphere® Data Replication (IIDR) CDC supports data replication from databases running on Windows Cluster services. Follow the step-by-step process that outlines all the required tasks to configure IIDR CDC on MSCS with failover capability.

Overview

Microsoft failover clustering supports a cluster of servers on the Windows operating system. It can automatically detect and respond to a server or an application failure, and can balance server workloads. Microsoft servers provide three technologies to support clustering:

- Network load balancing (NLB)
- Component load balancing (CLB)
- Microsoft Cluster Services (MSCS)

MSCS attempts to minimize the effect of failure on the system as any node (a server in the cluster) fails or is taken offline. This tutorial explains some basic concepts of MSCS and gives step-by-step guidance to setting up the configuration needed for replication with failover capability for databases running on Windows cluster services. We use a DB2® database running on MSCS as an example.

The figure below shows a database cluster configuration.
Failover clustering components

The cluster configuration consists of two or more nodes, each of which acts as an independent computer system. It appears to network clients as a single server. The nodes in the cluster are connected using one or more storage buses and through one or more independent networks. The network that connects only the servers is called a private network, and the network that supports the client machines is called a public network. Each shared storage is connected to one or more disks. Each disk is owned by only one node at a time in the cluster, as Microsoft cluster follows the shared-nothing model. The database software resides on the local disk and database files (for example tables, indices, and log files) reside on the shared disks (Quorum disk).

Database resource

In MSCS, a resource type is a service such as a shared disk or an IP address that must be made highly available. Common resources are:

- IP addresses
- Database instances
- File shares
- Shared disks

Database groups

Related or dependent resources are organized into resource groups. All resources in a group move between cluster nodes as a unit. For example in a single partition DB cluster environment, there will be a DB group that contains the following resources:

1. DB resource that manages the DB instance
2. IP address resource that allows client applications
3. Network name resource that allows clients to connect to the DB2 server using the name
   instead of the IP address
4. One more physical disks

**Failover configurations**

There are two types of configurations available:

1. **Active-Passive**: All DB instances are active only at a single node at any point of type.
2. **Mutual takeover**: Each node has its own primary node, but active at only one node at a given
   time.

This document explains InfoSphere CDC configuration for a database deployed in Active-Passive
failover cluster configuration and DB2 as the database.

**Minimal requirements for setting up replication on a database in
Microsoft cluster**

To set up replication on a cluster in a Windows 2008 R2 failover cluster, you need at least the
following resources:

- Windows 2008 domain
- Two nodes configured in failover cluster
- Two shared disks that can be accessed simultaneously from all nodes
- Domain controller/server Manager and DB cluster service created on the domain
- DB cluster group created
- Failover configured for DB cluster group

**Launching the Failover Cluster Manager**

To launch the Failover Cluster Manager, go to **Start > Control Panel > Administrative
Tools > Failover Cluster Manager.**

In our example, we will use the following names for the clustering components:

- Cluster manager/domain controller named wincluster.abc.com.
- Two machines named CLUSTERNODE1 and CLUSTERNODE2, running Windows Server
  2008 R2 Enterprise at abc.com domain.
  Each node has two network cards — one for the private network and the other for the public
  network.
- Two shared disks:
  - **Drive Q**: This is created to be the quorum of the cluster
  - **Drive E**: This is used for DB2 table spaces and instance profile storage
- A DB cluster group called DB2Group created and a DB2 cluster service (cdcdb2cluster1),
  registered in the domain abc.com, to access DB2 cluster services using the named service
  instead of the IP address.

The following figure shows the DB2 cluster configured in Failover Cluster Manager and its services
and cluster nodes.
The following steps show how to configure IIDR CDC on DB2 with a failover configuration, and to test the configuration:

1. Install and configure InfoSphere CDC on the shared disk that all the nodes in the cluster have access to (on Active node)
2. Create a CDC cluster service (on Passive node)
3. Add a CDC generic service to DB2 cluster group (on both nodes)
4. Create a data store in the management console
5. Testing failover

**Install and configure IIDR CDC**

The configuration is done using the public network. In our example, it is done on wincluster.abc.com.

**Installing IIDR CDC on shared disk**

CDC has to be installed on the shared disk because during the failover, the CDC binary file system has to be available on the same path as the failed-over node.

1. Log on to the Active node and install IIDR CDC on the shared disk. In our example, we shall install it on shared disk E.
2. After the installation, configure the instance with the port number and the database credentials of the cluster server.

Figure 3. IIDR CDC instance configuration screen

![CDC Instance Configuration Screen]

3. After installation is complete, do not start the instance.

Figure 4. CDC instance start/stop option

Create CDC cluster service

1. After creating the instance on the active node, to configure CDC in a failover configuration, a CDC cluster service has to be created on the passive node.
2. Execute the following `dmcreateclusterservices` command from the `%CDC_HOME%\bin` directory.

   ```
   dmcreateclusterservices.exe -I <instance_name> <passive_node_name>
   ```

Figure 5. Creating cluster services for CDC
3. The above step creates a generic cluster service on the passive node.

**Add a CDC generic service to the database cluster group**

1. After creating the CDC cluster service, start the CDC instance as shown below.

**Figure 6. CDC instance listing and configuration tool**

![CDC instance listing and configuration tool](image)

2. To automatically fail over CDC when the DB2 fails over, add the generic service of CDC under the DB cluster resource group (DB2 Group).
3. Launch the Failover Cluster Manager and follow the steps as shown below.

**Figure 7. Failover Cluster Manager — Adding a generic service**

![Failover Cluster Manager — Adding a generic service](image)

4. Choose the right CDC service to be added. The CDC service is identified by the name InfoSphere Change Data Capture (IBM DB2) [instance name]. Once the service is added to the resources group, it will no longer be displayed in the services list.
5. After selecting the service, make sure the service name is in the right format for the appropriate database type. The following figure shows the service name for DB2 databases.

Service name format for different database types:

- **DB2 databases:** `dmtsudb_<instance_name>`
- **Sybase databases:** `dmtssyb_<instance_name>`
- **SQL Server databases:** `dmtssql_<instance_name>

6. Add dependent resources that have to be brought online before bringing the CDC service online in case of a failover. In our example, we will use a DB2 database and will add a DB2 resource to be dependent before the CDC resource is brought up. To add a dependency,
right-click the CDC resource, go to dependency tab, and add the list of dependencies as shown in below. You may choose to add many dependencies depending on your requirement.

**Figure 10. Failover Cluster Manager — Add resource dependency**

7. In order to avoid failing over of the entire group (DB Cluster Group) when only one CDC instance fails or is stopped manually, uncheck the option **resource affected by**, under CDC resource properties. Depending on the version on Cluster Service Manager, the UI may differ. In Cluster Service Manager 6.1, right-click, go to the properties of the CDC resource, and uncheck the option **If restart is unsuccessful then failover all resources in the group**, as shown below.

**Figure 11. Failover Cluster Manager — Remove entire resource affected**
8. The CDC Cluster service remains in the offline mode when added for the first time. Right-click on the resource and click **Select** to bring this resource online, as shown below.

**Figure 12. Failover Cluster Manager — Bringing a resource online**

<table>
<thead>
<tr>
<th>Name</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nameckeditor1</td>
<td>Online</td>
</tr>
<tr>
<td>IP Address</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>File Server</td>
<td></td>
</tr>
<tr>
<td>File Server (ckeditor1)</td>
<td>Online</td>
</tr>
<tr>
<td>Disk Drives</td>
<td></td>
</tr>
<tr>
<td>Disk Drive Cluster Disk 3</td>
<td>Online</td>
</tr>
<tr>
<td>Other Resources</td>
<td></td>
</tr>
<tr>
<td>DB2051</td>
<td>Online</td>
</tr>
<tr>
<td>IBM InfoSphere Change Data</td>
<td></td>
</tr>
<tr>
<td>Capture (IBM DB2)</td>
<td>Online</td>
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<tr>
<td>Capture (IBM DB2)</td>
<td>Online</td>
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</tbody>
</table>

9. After the resource is online, the active node (CLUSTERNODE1) in the cluster will have ownership of the services.

**Figure 13. Failover Cluster Manager — Online resources**

Creating a data store in the management console

1. Create a data store in the management console, but instead of using the IP address use the cluster manager host name/high-available IP address. Configuring with the cluster manager name makes sure during failover there is no need to change the IP address of the data store.
The figure below shows usage of public hostname of clustering servers for configuring data stores for CDC instances in Management Console.

**Figure 14. Datastore configuration**

![Datastore Configuration](image)

**Testing the failover configuration**

During failover, all resources under a specific resource group is failed over completely.

1. To verify the CDC failover cluster configuration, right-click on the DB2 cluster resource group (DB2 Group) and move the service to another node in the cluster, as shown below.

**Figure 15. Failover Cluster Manager — Moving the cluster resource group**

![Failover Cluster Manager](image)

2. All cluster resources under the resource group will go to offline mode on the current active node CLUSTERNODE1, as shown below.

**Figure 16. Failover Cluster Manager — Offline resources**

![Offline Resources](image)

3. After successful failover, you will notice all the resources, including CDC cluster service, will be made online on the failed-over node CLUSTERNODE2.
4. Failing over of CDC services only restarts the CDC instances automatically and does not restart the subscriptions. For the subscriptions to be restarted automatically, right-click **Subscription properties** and enable the persistent subscriptions option. If this option is not enabled, subscriptions have to be restarted manually.

**Conclusion**

By configuring CDC services to be part of the database cluster resource group, the result is high availability to IIDR CDC instances whenever there is failover at the node level or the DB level.
Resources

- IIDR CDC IBM Knowledge Center
- IIDR CDC Data replication resource collection
- Microsoft Cluster Services MSDN Resource
- Read "A DB2 Native Encryption Primer" to learn how this new encryption capability works.
- Watch DB2 Native Encryption Highlights to get familiar with this new encryption capability.
- Learn more about Information Management at the developerWorks Information Management zone. Find technical resources, how-to articles, education, downloads, product information, community, forums, and more.
- Stay current with developer technical events and webcasts focused on a variety of IBM products and IT industry topics.
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About the author

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Amit Kumar is a staff software engineer at IBM India Software Lab focusing on data replication technologies. He has been with IBM for the past seven years and has strong expertise in IBM middleware products and database technologies. He has worked with a number of IBM solutions involving replication products like Change Data Capture and Q-Replication. He has also authored many technical articles.

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